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NAWCWD capabilities yield explosive results

An experienced technician from the Ordnance Processing Group at Naval Air Warfare Center Weapons Division opens a valve to allow the mixture of plastic bonded explosives to funnel into the cylinder at China Lake in February. (U.S. Navy photo)

The Salt Wells facility at the China Lake Propulsion Laboratory at Naval Air Warfare Center Weapons Division has a long and distinguished history of developing energetics dating back to Project Camel, the code name for China Lake's involvement in the Manhattan Project; the dedication to innovation that existed in 1945 is still very much alive today.

When a request from Lawrence Livermore National Laboratory to build a 15,000-pound cylinder for underground detonation was received, NAWCWD China Lake wasted no time planning the necessary steps to make it happen. In March, NAWCWD completed a two-week project of filling a 25-foot long, 30-inch diameter cylinder with nearly 10,000 pounds of explosives. This was the single largest item to come out of Salt Wells in its recorded history.

"We've never been involved in anything to this scale," said Kurt Seaman, section head for the Ordnance Processing Group. "Most of our work is smaller scale, single mix and cast operations. Typically, after one mix and cast, we're done; however, this effort required five mix/cast operations to fill the cylinder, which is not something we've done before."

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With about 30 employees from several divisions and facilities at China Lake, the crew was tasked with mixing five separate layers of plastic bonded explosives (PBXN-110) and continuously pouring it layer by layer into the cast to allow it all to cure at the same time. Tony Ullrich, a senior engineering technician, explained how they completed the nonstop effort with 24 hours of repetitive mixing, casting, and cleaning.

“We essentially loaded five separate 150-gallon mix pots one at a time and pre-conditioned the pots to the temperature that they were going to be mixed at,” Ullrich said. “Then, one at a time, the pots were transported to the mix bay where explosive powder was added. The PBXN-110 required four and a half hours of mixing and as each mix was completed, we loaded another pot while the other went up to be cast into the item.”

Details from creating a custom curing oven complete with circulating air and temperature sensors throughout, to casting, curing and radiographic inspection—or computed tomography—were all performed inside NAWCWD’s Radiographic Inspection Facility, where the asset was vertically housed while it was being manufactured. Although the facility’s primary function is the inspection of rocket motors, its large infrastructure, crane and elevator were ideal for the production of this project.

“What was really nice about the RIF was having an elevator that extended down below the surface,” said Zane Goedert, senior processing engineer in charge of the project at China Lake. “We could place the cylinder on the existing elevator, lower the elevator about 20 feet below the surface and cast the asset at a working height instead of having to build scaffolding. From there, we built a temporary oven to assist in curing the asset. So we cast, cured and then performed a CT scan without ever needing to move the asset from the elevator.”

This job, which has been in development since August 2015, has served as an example of a first-time, large scale project that has helped improve proficiency within the WD workforce. According to representatives from LLNL, the asset was successfully used at the Nevada Nuclear Security Site to conduct Source Physics Experiments in order to advance the United States' capability to differentiate underground nuclear tests from other seismic activity such as mining operations and small earthquakes. Having this advanced capability helps to identify whether state or non-state actors are hiding nuclear testing to develop or improve nuclear weapons. NAWCWD has already been asked to produce another asset in the future.

“This was a perfect project that really showcased our capabilities,” Goedert said. “From concept to loading the asset and from mixing to storage, this achievement really shows what China Lake has, and what we can do. This is what we do best.”

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A Naval Air Warfare Center Weapons Division technician uses a crane to hoist one of the150-gallon mixing bowls over to the cylinder for casting at China Lake in February. (U.S. Navy photo)

Weighing a total of 15,000 pounds, the completed asset is placed into a box for transportation and storage at Naval Air Warfare Center Weapons Division China Lake in March. (U.S. Navy photo)